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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/003,700	11/02/2001	Sergey Frolov	2100/2	2533

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EXAMINER	
CALEY, MICHAEL H	
ART UNIT	**PAPER NUMBER**
2871	

DATE MAILED: 10/31/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/003,700	FROLOV ET AL.	
	Examin r	Art Unit	
	Michael H. Caley	2871	

-- The MAILING DATE of this communication appears on the cover sh t with the correspondenc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 August 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *27-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *27-53* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 8/11/2003 have been fully considered but they are not persuasive.

Regarding the rejection of independent claim 27 as being unpatentable over Zenteno, Applicant claims that Zenteno fails to show or suggest the step of reducing dispersion by selectively supplying gain or loss to the optical energy in at least one of the feedback paths.

As evidence that Zenteno provides dispersion compensation by selectively supplying gain or loss to optical energy in at least one of the feedback paths, Zenteno discloses a negative compensation per channel filter coupled to an optical receiving path (Figure 1; Column 6 lines 18-24). Zenteno goes on to describe the functionality of the negative per channel filter as a dispersion compensation device (Column 6 lines 46-65). Finally, Zenteno describes an embodiment of the negative per channel filter having the same method of reducing dispersion as proposed in claims 27 and 41 (Column 9 lines 5-49; Figure 6 elements 130, 578, and 580). The gain selectively supplied to the feedback path is described as an Er doped PM fiber pumped by a 980nm laser source (Column 9 lines 8-12). The correspondence between selective gain in the feedback loop and the dispersion compensation is evidenced by the analogous function between the semiconductor optical amplifier of the other embodiments and the Er doped PM fiber of the embodiment of Figure 6 (Column 9 lines 25-28). Zenteno explicitly details the relation between the amplifier gain and the dispersion compensation (Column 10 lines 34-55; Figure 7 elements 640, 680, and 681).

Claim Rejections - 35 USC § 103

Claims 27-33, 36, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zenteno (U.S. Patent No. 6,522,450).

Regarding claim 27, Zenteno discloses a method of reducing the dispersion of an optical signal comprising the steps of:

Directing the optical signal to an input waveguide (Figure 6 element 120) of an optical device, said input waveguide being coupled to a first input port of an NxN network (Figure 6 element 578), where N is an integer greater than or equal to 2, said network having N input ports for receiving optical input energy and N output ports for providing optical output energy, said optical device further including (N-1) feedback paths (Figure 6 element 580) optically coupling (N-1_ of the input ports of the NxN nework to (N-1) of the output ports of the NxN network, a remaining on of the ouput ports of the NxN network providing a dispersion compensated optical output signal (Figure 6 element 132); and

selectively supplying gain or loss to optical energy in at least one of the feedback paths to reduce to a selected value the dispersion of the dispersion compensated optical output signal.

Zenteno fails to disclose the optical output energy at each of the output ports as arising from interference among the optical input energy received at the input ports. Zenteno teaches a coupler (Figure 6 element 578) with a coupling ratio determining the portions of the optical pulse

that are coupled into the feedback path of the ring and the portions that are coupled directly away through the output port via the coupler (Column 9 lines 19-23).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have constructed the coupler such that the optical output energy at each of the output ports arise from interference among the optical input energy received at the input ports. Such a design would have been advantageous such that proper coupling would occur in the ring resonator coupler as to correctly embody a fiber ring Fabry-Perot cavity with gain. The necessary coupling among optical energy received at the input ports would allow the device to be used for the intended purpose as a chromatic dispersion compensation apparatus.

Regarding claim 28, Zenteno discloses the gain or loss as selectively supplied by an optical amplifier that includes a rare-earth active element and a pump source for pumping the rare-earth active element (Column 9 lines 8-12).

Regarding claim 29, Zenteno discloses the rare-earth active element as doped in the feedback path (Column 9 lines 8-12).

Regarding claim 30, Zenteno discloses the rare-earth active element as extending along substantially the entire length of the optical waveguide. The ring resonator is disclosed as "a closed loop made of Erbium (Er) doped polarization maintaining (PM) fiber (Column 9 lines 8-12).

Regarding claim 31, Zenteno discloses the step of supplying gain or loss in the NxN network (Figure 6 elements 580 and 578).

Regarding claim 32, Zenteno discloses the optical amplifier as configured to provide gain to the ring resonator structure (Column 9 lines 8-12). Inherently, the amplifier substantially compensates for resonant and non-resonant losses that arise in the feedback path and NxN network due to the presence of the gain portion.

Regarding claim 33, Zenteno discloses each of the feedback paths and a portion of the NxN network as comprising at least one ring resonator (Column 9 lines 5-8).

Regarding claim 36, Zenteno discloses the NxN network as a 2x2 network (Figure 6 element 578).

Regarding claim 37, Zenteno discloses the 2x2 network as a directional coupler (Figure 6 element 580).

Claims 34, 35, 38, 39, and 41-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zenteno in view of Kazarinov et al. (U.S. Patent No. 6,289,151 "Kazarinov").

Regarding claims 41-46, 49, 50, and 53 Zenteno fails to disclose the step of selectively supplying gain or loss to optical energy in the NxN network to reduce to a selected value the

dispersion of the dispersion compensated optical output signal. Kazarinov, however, teaches an analogous NxN network dispersion compensation module in which the dispersion compensation controlling feature is located within the NxN network (Figures 9A and 9B element 305).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have supplied gain to the optical energy in the NxN network disclosed by Zenteno. One would have been motivated to design the network to include a gain supplying portion in order to improve the flexibility for designing the wavelength dependent feedback coupling module and also to improve the fabrication tolerances of the device (Column 9 lines 22-32). Such a modification would have been advantageous to improve the versatility of design of the device as well as the fabrication costs.

Regarding claims 34, 35, 47, and 48, Zenteno fails to disclose a plurality of ring resonators arranged as a ring cascade or as a series of coupled rings. Kazarinov, however, teaches such arrangements (Figures 6A and 6B) as alternative embodiments of the dispersion compensating NxN feedback network.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have constructed the dispersion compensating device disclosed by Zenteno with a ring cascade or as a series of coupled rings as taught by Kazarinov. One would have motivated to use such an arrangement in order to provide a more precise control over the dispersion compensating properties (Column 8 line 50 to Column 9 line 9) than the embodiment disclosed by Zenteno having only a single ring. Such an arrangement would provide a more advantageous

method of dispersion compensation in cases where a more precisely compensated signal is necessary.

Regarding claims 38 and 51, Zenteno fails to disclose the 2x2 network as a Mach-Zehnder interferometer. Kazarinov, however, teaches such a coupler used in the 2x2 network (Column 9 lines 10-13).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided the coupling structure taught by Kazarinov for the network disclosed by Zenteno. One would have been motivated to include such a coupler in order to improve the flexibility for designing the wavelength dependent feedback coupling module and also to improve the fabrication tolerances of the device (Column 9 lines 22-32). Such a modification would have been advantageous to improve the versatility of design of the device as well as the fabrication costs.

Regarding claims 39 and 52, Zenteno fails to disclose an all-pass filter located in at least one of the feedback paths. Kazarinov, however, teaches an analogous dispersion compensation device in which such filters are provided in the feedback paths in order to provide the phase delay necessary to perform the dispersion compensation (Figure 4B element 100).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided an all pass filter to the feedback paths disclosed by Kazarinov. In an embodiment having multiple feedback paths, it would have been advantageous to create a

cheaper and less power consuming device by incorporating such filters instead of gain devices by using a method as taught by Kazarinov (Column 9 lines 7-9).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael H. Caley whose telephone number is (703) 305-7913. The examiner can normally be reached on M-F 8:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

mhc

mhc

T. Chowdhury
Primary Examiner